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MONTHLY REPORT

March, 1935

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APPALACHIAN FOREST EXPERIMENT STATION

General

The new Director, C. L. Forsling, arrived March 26 to participate in a 2-day conference between the Station and administrative officers of Regions 7 and 8. The Station's projects were discussed in detail with reference to the administrative needs, separately presented for the two regions by A. C. Shaw and L. S. Gross.

Fire Studies (Mountain region)

An 8-acre plot on the Toccoa Experimental Forest in North Georgia was experimentally burned. Although the hazard prior to the fire seemed to be very moderate, a surprisingly hot fire was obtained. During the 45 minutes required to burn the plot wind velocity varied from 2 to 15 miles per hour, the humidity stood at 33 and the temperature at 71. Ninety-two hours had elapsed since the last measurable rain. The fuel, principally hardwood leaf litter averaging 4,500 lbs. oven-dry weight per acre, had an average moisture content of about 35 per cent. The upper layer of leaves varied from 8 to 10 per cent; the lower from 30 to 60 per cent.

Temperatures were measured at 16 points with fusible alloy spirals with the following results:

Percentage of spirals affected by fire

Height above ground	Melting point of alloys		
Feet	100°C	200°C	400°C
	%	%	%
5	94	62	25
10	88	38	0
20	69	6	0
30	19	0	0

Streamflow-Erosion

Wells for observing ground water were established on both the Coweeta and the Bent Creek Experimental Forests. These wells, designed to measure the amount of subsurface flow from the watershed, were established in line across the valleys of streams now being measured for their continuous surface runoff. One new float-gauge station was established near the mouth of Bent Creek to correlate the ground water studies now in progress.

Shortleaf, loblolly and white pine seed was stratified and placed in cold storage preliminary to making further tests with direct seeding methods on old fields. Recent check-up on preliminary direct seeding tests of 1934 indicate the following points should be studied further:

(1) The effects of delaying the date of sowing until after the spring migration of large flocks of seed-consuming sparrows, and until after insects are sufficiently abundant to constitute a considerable portion of the food for both rodents and birds.

(2) The desirability of sowing stratified seed.

(3) Methods of site preparation to facilitate rapid and uniform seed germination.

(4) Effects of removing protective cover to expose the planting sites in such a manner that rodents cannot feed upon the planted seed without being exposed to their natural enemies.

Erosion-Streamflow

San Dimas Experimental Forest

Certain modifications to the standard Parshall flume have been found necessary in using this device to measure debris-laden streamflow. The modifications comprise the following: 1) increased length of upstream walls, converging to the throat; 2) increased depth of entire structure; and 3) giving a descending gradient of 5% to the floor of the upstream converging section.

In order to calibrate structures with these modifications, a series of six flumes with crests varying in width from one to five feet and arranged in tandem in conjunction with several weirs were built below the San Dimas Flood Control Dam. This installation has been used to check the computed extension of Parshall's original rating curves which are for flows of less depth and to determine the effect on the rating of flumes with the contracting approach floor at slopes from zero to 7 per cent.

Experimental runs were made March 28 in the modified flumes. Water from the San Dimas Dam was passed through the test installation in amounts varying from about 13 second feet to 235 second feet, holding the flow steady at 14 intermediate points long enough to allow accurate measurement of depths of each structure, current meter measurement of velocities above the weir, and plotting of water surfaces within the flumes.

Preliminary computation shows interesting results. The flumes with level floor agreed closely in rating with Parshall's formula even at the highest flows, except for a constant positive variation of 2 1/2 to 4 per cent. Current meter results and volumes measured over the weir checked almost exactly. As for the flume with the sloping approach floor, a hydraulic jump existed at its entrance with flows up to forty second-feet. Between this point and the next reading, about 55 second-feet, the jump disappeared. As a result, while the rating curve is very smooth on either side of these flows, it shows a sudden offset between them. It is planned to duplicate these tests, using three-foot and one-foot flumes, and to try various alterations of the approach in order to eliminate the occurrence of a hydraulic jump at low stages.

A mounting for standard 8-inch rain gages has been devised to enable the gage to be elevated to the top of the vegetative canopy and readily lowered to be read. The trial gage is elevated on a pole 35 feet high.

Fourteen plots were established on the San Dimas area for phenological observations. Data collected to date indicate that the season of blooming is one month to 6 weeks earlier this year than last.

Fire Research

Following is an explanation of the approach and success obtained to date on the development of formulae for rate of spread of surface fires in ponderosa pine needles:

From a study of the data for slope fires in the laboratory, it was noted that the shape of the fire was a function of the slope, i.e., the ratio of the length and width for any particular time remained a constant for any given slope. From experience in the field with test fires, it was observed that wind also controls the shape of the area burned, which was usually elliptical.

The results of the laboratory fires showed that the lateral spread at any particular time is independent of the slope but is affected by the moisture content of the duff. From the above observations, the following assumptions were made:

1. The shape of the fire is a function of wind and slope, and the area burned will be elliptical. The ratio of the major axis to the minor axis, or a/b defines the shape of the ellipse.

2. The lateral spread, or spread along the minor axis, is a function of the moisture content of the needles.

3. Since the shape of the area burned will be elliptical, the perimeter will be $P = \sqrt{2}\,\pi\sqrt{a^2 + b^2}$, approximately, where "b" is 1/2 of the lateral spread or minor axis and "a" is 1/2 of the longitudinal spread or the major axis.

4. For preliminary calculations, time will not be considered. Its effect will be determined after preliminary calculations are made, and then the time function will be added to the equation.

To obtain the relation between the lateral spread in feet per minute and the moisture content of the duff; and the ratio of a/b, and wind velocity in miles per hour, 42 fires were selected with wind velocities ranging from 0 to 10 m.p.h., and with moisture contents from 3 to 13 per cent.

The relation between lateral spread "b", and moisture content "M" is $b = .97 - .05\,M$; where "b" is in feet per minute.

The relation between a/b and wind velocity in m.p.h. is $a/b = 1 + .44\ V$.

Substituting the above equations in the equation for the perimeter of an ellipse and factoring, we get $P = (4.32 - .22M)\sqrt{2 + .88V + .193V^2}$ where "P" now is in feet-per-minute perimeter increase.

Perimeters were calculated for 1933 and 1934 field test fires using the above equation and the deviation due to time was plotted against total actual perimeter. The correction was then determined for the equation to include time. The final corrected equation is as follows:

To simplify the equation let, $4.32 - .222M = A$

and $\sqrt{2 + .88V + .193V^2} = B$

Then $P = A\ B + (A\ B)^{1/3}\left[\frac{t}{-4\ A^{1/3}}\right]^{-2/3}$. Where "P" is in feet per minute and "t" is time in minutes from start of fire.

Using the time corrected equation, the perimeters for 1934 flat ground field fires were computed, and the standard error and per cent error were determined for two minute intervals. The per cent error based on actual perimeter remains a constant after 10 minutes at a value of 20%. The standard error at 10 minutes is 17 feet and increases in such proportion as to maintain a 20% error with increasing total perimeter.

It might be of interest to determine at what value of "M" or moisture content, the needles would become too moist to burn. With the equation one may readily calculate this value of "M" by making

$P = 0$

$P = 0$, when $4.32 - .22M = 0$

and $M = 19.65\%$, which is M/C. of needles in equilibrium with 92% R.H.

The equation may be made applicable to different types of duff by determining the lateral spread or "b" in feet per minute. It also may be used where slopes are envolved by determining the ratio of a/b, as a function of wind and slope which will merely change the constants and add an additional function representing slope under the radical of the equation. To date there is an insufficient quantity of data to determine the effect of slope upon ratio of a/b.

Logging and Milling Studies

Dow power saws handled by 2-man crews severed standing trees at the stump about three times as fast, on the average, as 2-man "gyppo" crews with axes and conventional cross-cut saws. But this denotes cutting speed only. When other items are added in and the total average times per tree are compared, the ratio stands at about 1.4 to 1. These results were obtained from time studies made by the Station in connection with the Fruit Growers' Supply Company logging and milling project last fall.

The tabulation below shows the division of felling time items for a contract crew and a power saw crew working on adjacent strips in a Site-2 stand of ponderosa pine. The ground was fairly level, young growth rather dense and the trees somewhat larger in average size then the ordinary run of east-side timber. Allowance must be made for the fact that the power saw crews had not had a great deal of experience and the saw itself was being remodelled from time to time as troubles arose because of improper design.

The average tree cut by the power saws was slightly smaller in d.b.h. than the average hand-felled tree, but the diameter of the average stump cut was 2.3 inches larger. Comparison of stump heights explains this apparent discrepancy - the hand fallers cut 14-inch stumps while the power-saw crews went down to an average of 7 inches from the ground. The maximum chain-saw clearance of 50 inches made it necessary to side-notch trees over 50 inches in diameter at stump height. Shallow notches were made with an axe. Deeper notching done by the power saw is included with the "sawing" item in the tabulation. The power saw shows a greater advantage over hand felling through the size range from 24 to 40 inches than is indicated by the average times per tree covering the full range from 17 to 60 inches d.b.h.

Item	Hand felling	Power saw	Hand felling	Power saw
	2-man crew minutes per tree		Percent of total time	
Planning	.71	1.25	3.5	8.4
Moving, tree to tree	.58	1.03	2.8	7.0
Swamping	1.32	2.12	6.5	14.3
Tools, adjust, etc.	.72	.37	3.5	2.5
Placement, power saw	-	1.89	-	12.7
Undercutting	5.42	2.29	26.5	15.5
Barking	.99	-	4.8	-
Notching with axe	-	.39	-	2.6
Sawing, main cut	7.18	2.30	35.2	15.5
Wedging	.51	1.06	2.5	7.2
Add oil and gas	-	.23	-	1.6
SUB TOTAL	17.43	12.93	85.3	87.3
Resting	2.74	1.31	13.4	8.9
Mechanical trouble	-	.32	-	2.1
Miscellaneous	.26	.25	1.3	1.7
TOTAL	20.43	14.81	100.0	100.0
Trees, number	120	71		
Average tree:				
D.b.h. inches	37.4	36.7		
Stump d.i.b. inches	35.5	37.8		
Stump height, inches	14.3	7.0		
Gross scale, bd. ft.	2,924	2,761		
Breakage, bd. ft.	34	58		
Breakage, per cent	1.2	2.1		
Gross scale utilized, bd.ft.	2,855	2,684		
Output per hour, gross scale	8,384	10,874		

CENTRAL STATES FOREST EXPERIMENT STATION

GENERAL

Central States Conservation Council. At the suggestion of Governor McNutt of Indiana, the Governors of Ohio, Indiana, Illinois, Iowa, and Missouri each appointed one or more representatives to form a regional organization, known as the Central States Conservation Council, for the purpose of coordinating group action on problems of region-wide importance and interest. The Regional Forester and the Station Director were invited to participate in the organization meeting held in Chicago on March 5-6. Outstanding problems were thoroughly discussed, and statements recommending action by the several states and by the Federal Government were prepared on a number of matters of importance. Among others, the immediate need for more work in forest research was strongly urged.

Miscellaneous. Baker and Day made a trip to Jasper, Indiana, to inspect the work being done on the Dubois County cooperative project, and to discuss plans with representatives of the participating agencies. En route, inspections were made of the buildings nearing completion on the Morgan-Monroe State Forest experimental area, and of the Station's cutting plots on the Clark County State Forest. Some of the latter have been destroyed by flooding and recreational developments.

Several of the new National Forest purchase units in southern Ohio were visited by members of the Station, for the purpose of locating an Experimental Forest area. A location which offers excellent opportunities for development and field studies was found in Vinton County on the Salt Creek Division of the McArthur Purchase Unit. Recommendations for its acquisition have been submitted.

As a result of a petition submitted by more than sixty forestry students, the Ohio State University authorities are seriously considering the expansion of forestry education to a four-year professional course. Recent developments in the Middle West indicate that another forest school in the central hardwood region may be needed.

Forestation

Forest Planting. Experimental plantings were made in March by field crews under the direction of Chapman and Kellogg at the Sylamore Experimental Forest in Arkansas, and at the Illinois Experimental Forest. In Arkansas, shortleaf pine was planted on old fields, partly pure and partly in mixture with hickory sprouts.

On portions of the pure plantings mulching and scalping were done to test any differences in survival. In Illinois the planting areas were prepared in advance, using plowing and dragging, contour furrows 6 feet apart, and no treatment, to check survival under these treatments. A small area, planted to yellow poplar, will be used to observe the effect of mulching with peat moss, fertilization, and no treatment on this species. Shortleaf pine (1-0 and 1-1), pitch pine (1-1), black locust (1-0), and yellow poplar (1-0) were used for these plantings.

Crews composed of selected local farmers were used in each case, and the work was done with grub hoes. A "Speedy Seedling Setter" (a form of the planting bar) manufactured by the Union Fork and Hoe Co., Columbus, Ohio, was tried out in Illinois, but not in Arkansas on account of the chert. The yellow loessial silt loam was found to be too heavy and silty to make for successful use of this tool. Grub hoes included blades 7" long, 9" long, and the curved "Italian grape hoe" with 7" curved blade. Planters liked the first two tools but didn't rate the Italian hoe at all.

Scarification of Black Locust Seed. Further work has been done on developing from an "Ames Scarifier" a machine which will satisfactorily scarify black locust seed in large quantities in a short time. Recent germination tests of scarified seed have been quite as satisfactory as previous ones. Anatomical and microchemical studies of the locust seed coat have shown definitely the difficulties which must be overcome in the process of scarifying. These difficulties lie in the two outer layers of the coat, a cuticularized epidermal layer one cell thick and a layer of palisade cells whose long axes are perpendicular to the surface of the seed coat. The palisade cells have thick walls with a considerable amount of suberin or corky material. As both cutinized and suberized substances are impermeable to water, it is necessary to striate the seed coats through these layers. Microphotographs and diagrams are being prepared to appear later in publication.

Stream-Flow and Run-Off in the Ozarks. Chapman and Kellogg crossed the Mississippi bottoms and followed up the White River drainage to the Sylamore Experimental Forest just ahead of the March flood. On the afternoon of March 9 the White River was almost bank full at the ferry south of Newark, Arkansas, from earlier rains. A gentle rain began when the party was just west of Batesville, and continued as heavy showers on through Saturday night. Perhaps 2 inches or more fell. Drizzly rain fell off and on during March 10. About 2.6 inches of rain collected in a tin cup during the following night, and 1.1 inches during March 11. There was no rain the following night, but the temperature dropped to freezing. At the lookout a mile west of the Sylamore Station about 7 inches of rain were recorded during this period.

On the Sylamore area a rather good condition of litter can be found, because of the absence of fire for a period of years. Following these rains, it was observed that quite heavy run-off occurred in spite of the cherty mantle on the ground beneath the litter. Every course held a stream of water, but the run-off in ravines and Sylamore Creek itself was relatively clear. By March 15 these same ravines were dry, and Sylamore Creek was back to normal.

The other rivers of the Ozarks recorded high stages. White River at Calico Rock was said to have reached a 40-foot stage, and 150 yards of road in the bottom were washed out. The bridge at Sylamore was under 6 feet of back water from the White River. Buffalo River reached about 30 feet; Current River at Van Buren, Missouri, was said to have reached 20 feet; and high stages flooded the bottoms of the Black and St. Frances rivers.

In spite of the heavy rains and property losses from flood, litter was dry by March 15, and the forests were burning again. Before the flood waters had receded, no less than 25 fires were seen in driving from Cotta, Arkansas to Cape Girardeau, Missouri.

Forest Management

Dubois County Sustained Yield Project. Progress on the cooperative sustained yield project in Dubois County, Indiana, has been generally satisfactory. Kuenzel and Diller have very largely completed their volume table and growth and yield studies for this project, and with the exception of filling in certain gaps, which undoubtedly will appear, this Station's contribution to the first phase of this project is nearly finished. It will be necessary to gather data on cull per cent at an early date.

Increment data has been secured for the tree species in the black oak-scarlet oak type, the white oak-black oak-hickory type, the beech-maple type, and the pin oak-red gum type. A comparison of the growth rates in Dubois County with those obtained last fall in Clark County for similar forest types showed the Clark County rate of growth to be considerably lower. Dubois County D.B.H. height curves compare very favorably with similar data obtained from a woodland in Marshall County in northern Indiana.

Stand and stock tables for the several forest types encountered, and increment tables, are being prepared. An analysis of the fluctuations in the growth rate of the hardwood species studied indicates the desirability of thinning to maintain rapid rate of growth found in the younger trees, and again in those that had passed through a period of severe competition and had successfully established their dominance. The data clearly indicate the retarding of growth by competitive crowding, and the age at which this occurs.

One of the principal reasons for the initiation of the Dubois County project was the realization by the public agencies cooperating with the Lumber Code Authority that Article X would be practically impossible to enforce in the northcentral hardwood subdivision under existing conditions of ownership. Much evidence is being accumulated to indicate that as far as this region is concerned the Lumber Code is not effectively reducing devastation of the forested areas, particularly of the farm woods. Diller is preparing a short article covering the destructive logging practices which have developed as a result of the great number of small operators who have come into the portable sawmill field recently. The general practice over considerable areas of northcentral Indiana is to purchase fairly large tracts of farm woodland, remove such timber as is merchantable for lumber and ties, and then sell the land to an associate who is engaged in the post business. He proceeds to strip the area of practically every stick of timber, stocks it heavily with goats for the avowed purpose of keeping the sprouts down, and attempts to sell the stump land for agricultural purposes. Usually the land is of low agricultural value and erodes seriously if broken for crop production.

Need for Volume Tables. It has become increasingly evident that the amount of volume table data available in this region is deplorably inadequate. The only satisfactory tables which have been developed, aside from those of plantation walnut and locust, are those which have been constructed in connection with the oak yield study carried on by the Appalachian, Allegheny, and Central States Stations. These tables are based entirely on even-aged stands, which probably have a different form factor than the same species in all-aged stands. Moreover, the tables are usually not extended beyond 24 inches D.B.H. In addition to the demand for volume table data for the Dubois County project, the new National Forest Purchase Units in Ohio, Indiana, and Illinois have been seriously handicapped in their acquisition work by the lack of suitable volume tables.

Farm Woodland Management. Lack of funds and personnel during the past few years have prevented the expansion of the farm woodland management project much beyond the grazing studies carried on since 1929. With the anticipated increase of funds through new Nira allotments, plans are being perfected for the management phase of these studies. Considerable preliminary work has been accomplished in Ohio, Indiana, and Illinois in the selection of cooperative areas for management work, and it will be possible to utilize a number of the plots established for grazing studies in this connection. The Purdue Agricultural Experiment Station will cooperate actively this year in both the grazing studies and in the proposed management studies.

Forest Soils

On March 1, Auten gave a talk on his forest soil and forest influence studies to the staff of the Soil Erosion Service at Zanesville, Ohio. During the latter part of the month he and Chapman have helped Forest Supervisor Groesbeck to locate sites in southern Ohio suitable for a Forest Service nursery. A conference was held with Harold Scholz of the Lake States Station regarding the measurement of soil porosity and the installation of forest lysimeters. In addition to preparing plans for the coming field season, time has been spent in designing and constructing an amplifying unit for soil acidity measurements in the field.

Forest Insect Investigations

On March 1, Hall attended a meeting of the North Central States Entomologists at Urbana, Illinois. Following this meeting, he contacted Extension Forester Sawyer, and Page and Secrest in southern Illinois, where certain areas were examined and surveyed for the purpose of making planting experiments. During the last half of March, experimental mixed plantings were made on the Gustafson property near Bath, Illinois, in cooperation with the Extension Forester. Mixtures of black locust were made with red cedar, Virginia pine, white pine, Norway pine, pitch pine, ailanthus, cottonwood, and red maple.

In addition to the mixed plantings, about a thousand "shipmast" locust were planted along with the same number of seedling locust, at Bath. Also, about 500 shipmast locust were planted near Arenzville, and another 500 on the Illinois Experimental Forest near Elizabethtown. These shipmast locust were some which the Bureau of Plant Industry had propagated by root cuttings which had been gathered on Long Island. This experiment is being conducted jointly by the Bureau of Plant Industry and the Bureau of Entomology to test out their resistance to locust borer injury in various parts of this region. During early April, it is expected that additional stock will arrive from Long Island, and this will be planted in Ohio, Indiana, Michigan, and Iowa.

It appears from observations which were made during the last two days of the month, that the spring of 1935 is at least two weeks in advance of 1934. At the present time, black locust is in full leaf in southern Illinois.

LAKE STATES FOREST EXPERIMENT STATION

Selective Logging in Northern Hardwoods.

Since the new acquisition policy in Region 9 permits purchase of selectively-logged timber, the results of the Station's work on selective cutting in northern hardwoods have definite application.

In order to agree on a method of cutting which will satisfy all the interested parties - lumberman as well as the Forest Service personnel - and at the same time be good silviculture, a meeting was held at Rhinelander, Wisconsin, at which the Station was represented by J. R. Neetzel.

The timber there is overmature and the cull will probably run as high as forty per cent. The men on the acquisition survey marked four ten-acre plots and then the Station's representative re-marked two of these blocks in the light of the experience gained at the Upper Peninsula Branch Station. Even when marked conservatively only about 25 per cent of the stand could be left. In order to see how the stand will look when cut over, the lumber company has agreed to cut over the sample marking areas in the near future. Cost records will be kept and the material will also be followed through the mill.

Winter Habits of Deer

A study of the winter habits of deer was made on the Kawishiwi Experimental Forest by CCC personnel by following several individuals and groups of animals about the forest. Two different areas were covered. In one area CCC men were engaged in clearing up wind-falls; the other area had no humans working in it.

It was found in this study that deer did not stay in the swamps, and that when they crossed swamps they left a straight trail and not the meandering type left when they were traveling on the upland. Apparently deer do not travel far and they bed frequently. One deer, for example, traveled less than one-half mile in 24 hours and bedded five times during this period. All of the beddings examined were under coniferous trees and the great majority were on the south or southeast side of the trees.

It was found that when the animals traveled in groups they followed one another in single file so that the number in the group could not be determined from the tracks. In a single group the individuals bedded within a short distance of one another. The deer did not step off their trail to feed. They ate whatever

could be reached from where they stood and as hazel was the most abundant shrub, this furnished the chief item of diet.

One of the most interesting observations was that more deer were found in the area where the CCC workers were engaged in the clean-up work than on the area undisturbed by humans. The deer apparently preferred the inhabited area. The most likely explanation is that traveling is easier due to the trampling of the snow by the workers. This is one specific instance where CCC workers did not drive animal life from the woods.

Accuracy of Plantation Surveys

A large number of National Forest plantation survey records were analyzed for the purpose of determining their accuracy and to develop a guide to the accuracy obtained by varying intensities of surveys. It was found that the statistical method often applied to problems of this type does not give the correct result inasmuch as it considers only the error introduced by pure chance and does not take into account the variation in survival resulting from such factors as local differences in soil, exposure or brush cover. The heterogeneity of such conditions within any one plantation contributes vastly more to the error of the results than the variation due to pure chance. This heterogeneity of conditions affecting survival varies considerably from one area to another. In the case of plantations on the Huron National Forest where each planting chance presents nearly equal conditions of soil and slope, the heterogeneity factor is low. On the Superior National Forest, a wide range of soils and exposures is often encountered within the boundaries of a single plantation and therefore the heterogeneity factor is high and a more intensive survey must be made in order to attain a corresponding degree of accuracy.

Forest Survey Office Established in St. Paul

The headquarters office of the Forest Survey, established in Duluth in the fall of 1933, has been transferred to St. Paul, where desirable quarters have been obtained in the new Post Office building.

New National Forests in North Dakota

On the basis of the Station's planting work at the Northern Plains branch, 260,000 acres in the sand-hill country of North Dakota has been included in a National Forest purchase unit. The Station has carried on planting experiments in this section and as a result of the good showing made by certain of these, Region 9 was encouraged to submit the case to the National Forest Reservation Commission which granted its approval for the purchase.

Co-Operation with the Land Planning Commission of South Dakota.

A co-operative forest survey and shelterbelt project was initiated in South Dakota. Region 2 has assigned E. R. Ware, Assistant Supervisor of the Black Hills National Forest to carry on the work under the supervision of R. N. Cunningham of the Experiment Station. Ware will cooperate with the State Planning Commission in collecting survey information on natural woodlands, planted groves and shelterbelts. Several hundred E.R.A. workers will be employed to assist in the work.

General

On a series of sample plots on the Bartlett Experimental Forest, tagged in the fall of 1933, excessive vertical cracking of trees was very noticeable last summer. Since the cracks all originated from the point of entry of the tag-nail in the tree, it was apparent that the nails caused the cracking; however, the severe low temperatures during February of 1934 probably increased the amount of cracking over that which would occur during normal winter weather.

Much of the data obtained from an investigation of the cracking by Morey and Jay Munns have not been completely analyzed, but some rather interesting preliminary information has been obtained, is summarized in Table 1. The greatest number of cracks occurred in red mapel, beech, and sugar maple. The maximum vertical length of cracks by species ranged from 36.1 inches in red maple to 1.4 inches in hemlock. It is interesting to note that horizontal cracking developed in yellow birch and beech. In birch this may have been due to some extent to the proximity of lenticels to the nail. Although larger diameter classes in some species were affected, most of the damage was confined to the smaller diameters (10 inches and below). Callus growth was well developed in many cases. This damage might have been lessened if the tags had been attached by small gauge escutcheon pins instead of by 1 1/4 inch copper nails.

TABLE I: CRACKING OF TAGGED TREES ON PERMANENT SAMPLE PLOTS

Species	Percent of Trees Cracked	D.B.H. Class of Largest Trees Cracked	Maximum Vertical Length of Crack	Maximum Horizontal Length of Crack	Average Thickness of Callus
			Inches	Inches	Inche
Beech	69	18	3.1	.9	.10
Birch, yellow	15	10*	8.2	2.0	.08
Hemlock	18	4	1.4	-	.09
Maple, Red	78	12	36.1	-	.12
" Sugar	69	9	4.2	-	.06

* One tree in the 20" D.B.H. Class.

Forest Economics

Consideration has been given to the possibilities of working out a cooperative forest management, wood utilization, and marketing scheme at Cooperstown, New York, and $20,000 for the purpose was included in the Agricultural Appropriation Bill as recently passed. The project will involve studies of methods of handling material from farm woodlots from stump to market through the agency of a permanent community conversion plant. A Syracuse graduate, Raymond Rogers, has already developed much local interest in the project and has gathered much of the basic data needed for its inauguration. The Station has cooperated with the State T.E.R.A. in preparation of a prospectus of the project so that application may be made for financing the necessary capital expenditures through a Rural Rehabilitation Corporation if such an organization is sanctioned by the legislature.

In this project the Station will cooperate with the New York State College of Forestry at Syracuse and possibly also with the Extention Forester at Cornell. Study of similar units in other communities is also contemplated when the work gets under way.

Growth of Spruce on Cut-Over Lands.

In developing formulae for expressing pulpwood yields for cut-over spruce-hardwood lands, basic differences were recognized by treating the data in two broad types: (1) spruce hardwoods, (2) Spruce flat. In the former type spruce and fir occur in mixture with numerous hardwoods, a high proportion of which consist of beech and sugar maple, natural rivals of spruce and fir. The spruce flat type supports chiefly spruce and fir, generally in mixture with a few hardwoods such as red maple, yellow birch, paper birch, and aspen. These hardwoods being much less tolerant than beech and sugar maple compete less strenuously with spruce and fir. In other words, the relationships obtaining in the spruce flat are perhaps simpler than those in the spruce hardwoods.

The more complex character of the spruce hardwood type is reflected in the regression lines developed to express yield of spruce and fir in terms of time since cutting, density index, and basal area of hardwoods. Whereas for the spruce flat, a straight line appeared to express the relationship satisfactorily it was quite evident that this was not the case in the spruce hardwood type where joint correlation was plainly indicated. However, after adjustments for curvature a multiple correlation index of .721 was obtained, while the standard error of estimate was reduced to 267.62 cubic feet. Plotting of actual volumes over third estimate volumes produced a satisfactory 45° straight line passing through the origin.

Silviculture

For some time it has been strongly felt that the usual method of crown classification, i.e., dominant, codominant, intermediate, and suppressed, does not apply to trees left after thinning, in dense, mixed stands such as are found in the western white pine type. At best, this classification is not a good measure of general tree vigor and quality especially as it may be affected by thinning. To meet this need Davis has devised a method of tree, rather than crown, classification that it is hoped will be more nearly adequate. The proposed classification is patterned closely after the Dunning system in that an effort is made to group trees by certain combinations of characteristics that are believed to be closely correlated with their growth and development. The system is based upon a consideration of four major factors:

1. Form, density, and volume of the crown as an indicator of general vigor and the effect of competition.
2. Height.
3. Form of the bole - an indicator of quality growth.
4. Relative diameter and leader growth rate.

A brief description of the tree classes recognized is as follows:

Class 1. Crown, full, dense, and symmetrical, showing little effect of competition for at least the upper third of the crown; height, above average, usually the tallest in the stand; bole, large, strong, with a tendency to be limby; growth, most rapid in the stand.

These are the super-dominants; trees slightly older or of the same age as the rest of the stand that because of superior seed quality, position, or generally favorable circumstances have definitely outstripped the rest of the stand.

Class 2. Crown, good density, depth, and form, although usually showing the effect of some competition; height, slightly above average; bole, tall, strong and fairly clean; growth, rapid, being exceeded only by Class 1 trees.

These trees before thinning were the average dominants; trees that have not undergone heavy crown competition but that do not distinctly dominate the stand. These trees are well established and would probably form a part of the final crop even if no thinnings were made.

Class 3. Crown, only fair density, depth, and volume, usually somewhat one-sided, flat, or wedge-shaped as a result of rather severe competition from the sides; height, average; bole, long, slender, and well cleaned of branches; growth, fair.

Before thinning these trees would be classed as the poorer dominants or average codominants; trees that have undergone severe competition but that have been able to keep their crown in the upper level. These trees should respond well to release and also should be capable of producing high quality products.

Class 4. Crown, rather short and thin as a result of severe crown competition on two or more sides; height, definitely below average; bole, usually slender and clean; growth, fair to poor. Before thinning these trees would be classed as the poorer codominants and the better intermediates; trees still capable of making good growth after release, particularly in quality, and in the case of valuable species would be capable of becoming final crop trees.

Class 5, Crown, thin and short as a result of severe competition from the sides and some from above; height, two-thirds or less of the average; bole, short and tapering; growth, poor.

Before thinning these trees would be classed as intermediate or occasionally suppressed. These trees are, however, still considered capable of recovery and fair growth when released. They would be left after thinning largely to improve spacing and on the chance that they might add something to the final crop.

Class 6. Open grown trees that have never been affected to any extent by competition. This class is intended to include trees found in occasional openings that do not fall into any distinct class.

Class 7. Suppressed or intermediate trees either ignored in thinning or left merely as "fillers" or "trainers" with no possibility of their ever becoming crop trees.

This classification is particularly intended to apply to trees left after thinning in dense, young, even-aged, mixed stands in the western white pine type. However, with some adaptation it should be quite widely applicable to similar stand conditions in other types. The system was applied during the previous summer to some six thousand trees left following a thinning and it was felt that a natural grouping of trees was effected. The growth of these trees over a period of years will definitely indicate if this classification groups trees of similar growth response and is significantly superior to the usual method.

Fire

The fire danger meter has recently been revised in accordance with field tests for two fire seasons on ten Forests. Two major changes were made: (1) eliminating number of people on the forests as a factor in raising or lowering the rating, and (2), specifying more definitely the fire control action warranted for each class of danger.

Hornby's studies have shown that man-caused fires have never caused peak loads at all comparable with the danger from lightning. Furthermore, most R-1 Supervisors agree that increases in the number of people on the Forests on weekends, holidays, and during the hunting, fishing, and berry-picking season do not increase the danger of fire enough to warrant adding to the number of lookouts and smokechasers. Consequently, the revised fire-danger meter does not recognize increased number of forest visitors as a cause of increased danger.

Lightning also has been defined on the meter so that storms with all the lightning confined to the clouds will not cause a higher rating of danger.

The major change on the meter resulted from experience on the Selway in 1934 which showed the justification of more specific statements of the fire-control action warranted by each class of fire danger. The old meter specified that to meet class 5 danger the supervisor should "man a few emergency stations." The revised meter states, for class 5 danger: "After one day finish placing the full average or normal fire season organization. After two consecutive days commence filling 'first overload' positions. After about seven consecutive days complete the first overload." If such action had been taken on the Selway in 1934, the Forest would have been better manned to cope with the situation which arose on August 11, when the 250,000-acre Pete King fire originated.

During the period of testing the principle of a danger meter, no definite Regional policy was stated to guide the supervisors in their actual use of the device. As a result some supervisors applied the meter recommendations quite intensively while others continued to rely largely on personal judgment. The results of this two-year test were sufficiently definite to justify a statement of Regional policy. This was prepared by the Experiment Station and approved by Major Kelley. This statement of Regional policy recognizes the need of measurements, accepts the danger meter as a method of integrating factors, requires consideration of these measurements and meter ratings, and places responsibility for local use upon the supervisors.

A fire-danger conference is to be held at the Priest River Station in late April. Some 25 men are expected to attend, including 15 to 18 from the R-1 fire forests, 2 from the National Park Service, and representatives from Region Four, Region Six, and the Weather Bureau. The principal purposes of this meeting are: (1) to train at least one man on each forest in the technique of fire-danger measurements, (2) to have these men tell each other how they have used these measurements to get better fire control, and (3) to obtain the advice and opinion of field men concerning the methods of measurement advocated by fire research.

Statistical Seminar

An average of 42 Experiment Station employees regularly attended the Statistical Seminar that has been conducted by Jemison during the past four months. Average attendance from the various offices was as follows: Silviculture--7, Fire--5, Survey--22, Products--4, and Range Research--4.

The course this year covered the fundamentals of statistical methods, practically the same material that was studied in a similar course conducted last winter. In addition to study of frequency distributions, theory of errors, and simple correlation, some time was spent on multiple correlation, sampling technique, and analysis of variance. Special emphasis was placed upon the analysis of practical forestry problems.

Census

Production, lumber distribution, and stumpage price schedules from approximately 200 Idaho and Montana operators were edited and prepared for transmittal to Washington during the past month. Including the returns previously transmitted, about 95 per cent of the total volume of production for these two states has been accounted for. Reports to be obtained from 80 or 90 small mills still on the delinquent list will add only a few million feet to the cut figures now available from our preliminary tabulation.

The following statement shows the comparative cut by identical mills producing five million feet and upward in 1933 and 1934:

State	No. of Mills	Lumber cut M feet b.m.		Percent of increase 1933 - 1934
		1933	1934	
Montana	6	106,367	136,940	28.7
Idaho	17	254,987	372,530	46.1
Totals	23	361,354	509,470	40.9

The mills on which this statement is based produced 82 per cent of the total cut reported for Idaho and Montana in 1933. Including additional production by mills cutting less than 5000 M feet which have reported, and conservative estimates for the delinquent mills, it is predicted that in comparison with the total 1933 output, final figures for 1934 will show an increase of about 33 per cent for Montana and 42 per cent for Idaho.

Range Research

The 1934 drought continued through a mild open winter at Miles City, but wet snow storms during late March provided some moisture to start spring growth. Only a very timid note of optimism at the outlook for grass seems warranted at present.

Woolfolk is now at Miles City and the 60 cows that have subsisted entirely on hay since November will be moved back to our experimental range pastures early in April for calving. A partial ration of hay will have to be continued for some time because of short range forage.

Grass seeds of various kinds are being supplied to cooperators under our artificial reseeding agreements for seeding in April, for comparison with fall reseeded areas. Fall seeding is coming up in a few cases. It is anticipated that at least 1,000 acres will have been reseeded since October, 1933, by the end of this spring seeding period.

PACIFIC NORTHWEST FOREST EXPERIMENT STATION

Experimental Forests

The Region 6 committee met to consider the proposed Blue Mountain Experimental Forest and Range, The report was approved without modification. The proposed area is located in the ponderosa pine type of eastern Oregon in the Blue Mountain region and contains 11,471 acres.

Section of Silviculture

Fire Studies - All the fire studies received attention during March in order to bring all current and seasonal activities up to date and to make plans including the preparation of project sheets for future work. The fire danger station program was the subject of several conferences with Regional Office men. Morris has the service job of preparing hazard indicator sticks, getting out supplies of record forms and revising instructions well under way, and this work will be completed some time in April. About 200 sets of hazard indicator sticks are being prepared. Effort is concentrated upon clearing away routine jobs just as fast as possible in order to be able to devote time to plans and preparations for the expanded program that is on the horizon.

Cooperation was given to the Regional Office of Fire Control in planning for a fuel type mapping project, also for an intelligence unit for service on major fires to head up all scouting, communication, weather and research activities.

McArdle returned to the Station for about ten days and made considerable progress in the preparation of a manuscript, "Visibility Factors Controlling the Efficient Location and Operation of Forest Fire Lookout Stations", which it is planned to publish.

Section of Forest Products

Numerous general requests have been handled; among them (1) suggested treatments for preventing season checks in walnut logs, (2) identification of two wood samples, (3) information on direct labor costs in logging and milling, (4) examination of pole sample for decay, (5) information on charcoal production, and (6) the general run of requests for statistical data.

A short trade journal plea for the use of noble fir rather than "larch" for the wood of Abies nobilis was prepared.

Cooperation - Upon request of the Supervisor of the Shasta National Forest, a carload of 390 short butt-treated cedar poles was inspected at the East Milwaukie treating plant.

R. O. specifications as to species and preservative treatments of poles in primary and secondary lines have been checked. Tentative plans to provide inspection service on installed lines and to establish several experimental pole lines have been prepared.

Lumber, lath, and shingle census - Johnson spent nearly one half the month editing Census schedules. To date 1,277 acceptable schedules have been forwarded to Washington; 704 this month. There are about 450 companies yet to hear from.

Northern black cottonwood - This report has been completed and is ready to forward to Washington. It is planned to publish the report in one of the local trade journals, securing about 50 reprints for distribution.

Pulpwood conversion factors.- Johnson measured 28 cords of pulpwood at Salem. A report on pulpwood conversion factors in the Pacific Northwest has been prepared in rough draft.

Statistics - Twelve charts of price movements in chemical forest products were blue-line printed and distributed. These supplement charts issued last year. Three tables of log, round timber and burl exports, supplementing those issued last year were mimeographed and distributed.

A report summarizing water shipments of cascara bark from Oregon and Washington, 1920-1934, was mimeographed and distributed.

The collecting and tabulating of lumber export data from the records of the Merchants Exchange of Portland was continued. These data are being obtained to allow the more complete segregation of lumber shipments by countries and items than is now obtainable from other sources.

Deterioration of fire-killed timber - The combined report is well under way with Products, Entomology and Pathology cooperating in the writing.

Forest Economics

Logging Economics - Brandstrom remained in Washington, D. C. during the month revising the joint Kirkland-Brandstrom manuscript "Principles and Procedures of Selective Timber Management in the Douglas Fir Region." A copy of the revised report was sent to the

Station and reviewed by various members of the Experiment Station and Regional Office staff.

Land Economics - The correlation of cover to tax delinquency for the 18 counties studied was completed during the month. This was computed by acreage and percentage, county by county, and summarized for Oregon and for Washington.

The estimated assessed values of county-owned lands by assessors' classes for each of the 18 counties were summarized by states.

Data on the use of land for agricultural purposes have been arranged in tabular form by counties and summarized by counties and by regions in the two states.

Field work was conducted in Columbia County covering land ownership and tax data for school districts 18, 27, 42, 50, and 52, ownership and tax data on sample parcels of real estate acreage resold by the county, lands acquired by the county through forfeiture for unpaid taxes since April 1932, and county policy in handling tax delinquent and forfeited lands. All these data have been compiled. County lands recently acquired have been mapped on 1-inch-to-the-mile township plats.

Mensuration

Spruce-Hemlock Yield Study - Yield tables are now almost ready for the spruce-hemlock type, showing values for the total stand and for three classes of partial stands to take care of progressively cruder degrees of utilization. These partial stands are for the trees 7 inches plus, 12 inches plus, and 15 inches plus. Stand tables are taking form for number of trees, cubic-foot volume and board-foot volume. In this computation a comparison is being made between graphical methods and computational methods (Charlier). With the type of graphical method used, the agreement was astonishingly close as far as gone.

Ponderosa Pine Yield Study - The wide range of stocking and the presence of large numbers of stagnated stands are furnishing difficulties in the pine study. Contrary to the spruce-hemlock study where the site index curves seemed to follow the anamorphic principles, in the pine study there is a radical departure. As a result the site index curves will differ greatly from any of those previously published.

Forest Survey Growth Predictions - Three types of growth prediction have been completed for the Douglas fir region, and the fourth type has a good start. The first three predictions were for current annual growth, potential growth, and periodic growth

for revision of volume estimates. The fourth prediction is designed to show the amount of mean annual growth which will be realized from the present time to the time when the stands of various types, sites, and ages will be cut. This value will furnish the soundest basis for comparison between depletion and cut.

Forest Survey

The Forest Survey spent considerable time copying cruise data available in Portland for the Regional Office in Region 5, and also obtained the status of state lands in Olympia for Stevens, Spokane, and Pend Oreille Counties, Washington, for the Rocky Mountain Forest Experiment Station.

Map copy for the lithographer showing the boundary of all types for the 1/4-inch state type maps for the southwest quarter of Oregon and the northwest quarter of Washington was sent to Washington, D. C. Map firms and book stores were contacted in order to see what arrangements could be made for the selling of the lithographed state type maps when they are ready for distribution.

The regular run of requests for Forest Survey maps and data continued. The records show that written requests or personal calls for Survey inch-to-the-mile colored type maps were made during every day in March. The vast bulk of these are local but several were received from other parts of the United States and some from foreign countries.

Douglas fir region - The regular Survey staff continued on the job of report writing. As of April 1 the report writing job is about 45 per cent completed. The preliminary regional chapter on methods, etc. is entirely done. The status of unit reports is as follows: North Puget Sound, completed; Central Puget Sound, 25 per cent completed; South Puget Sound, 60 per cent completed; Columbia River Washington, 75 per cent completed; Columbia River Oregon, 45 per cent completed; North Oregon Coast, 70 per cent completed; Umpqua River, 35 per cent completed; South Oregon Coast, 30 per cent completed; Rogue River, 15 per cent completed.

Ponderosa pine region - Steady progress was made on inventory phase computations. The work on ownership status and official land office areas has been completed for all the area on which field work was done last summer. Type area and volume computations are practically completed for Klamath County, Oregon, and well along in Deschutes and Jefferson Counties, Oregon.

Printed type legends for the 1-inch-to-the-mile maps in eastern Oregon and Washington have been colored and distributed to all parties having received these maps. The Regional Office was con-

tacted in connection with the location of Survey forest unit boundaries. The first scheme for unit boundaries has been abandoned and a new scheme tentatively agreed on. One-inch-to-the-mile Survey maps for those portions of eastern Oregon and Washington which were completed last field season have been made and distributed to the forest supervisors in the eastern parts of these two states.

In March, two additional men started field work in Yakima County, making a total of five men now in the field in the ponderosa pine region.

Naval Stores

The Coast Turpentine Operation at Long Beach, Mississippi has secured high gum yields which were attributed, in a large part, to good chipping management. The operator has taken advantage of the relationships between temperature and gum yield and has varied the frequency of his chipping with seasonal weather conditions. In order to regulate the small size of chip taken off at each streaking this company uses a 5-C hack, the smallest hack that has ever been used in a commercial operation.

An experiment to test a third phase of the effect of fire on gum yield was initiated. Experiments completed or being continued are testing the effect of defoliation and of removal of the ground cover. Possible injury through burning the face is now being studied. One group of faces was burned this month, two other groups are to be burned late in April, one of which is subsequently to be rested for the remainder of the chipping season. A further group will not be treated. Penetrometer measurements were taken to determine the effect of burning on tree hardness as it would effect chipping.

Forestation

The 1934-35 planting program, which was started on Dec. 13th, on the J. K. Johnson Tract of the Palustris Experimental Forest near Alexandria, La., was completed on March 1st. CCC labor was used throughout the planting season under the supervision of Wakeley and Olsen. In the 482 plots established, a total of 349,301 trees were planted. Of these, 165,131 (47.2 per cent) were longleaf, 183,246 (52.5 per cent) slash and 924 (0.3 per cent) Sonderegger pine. Seventy eight per cent of the trees were planted in long-time spacing studies. 10 per cent in short-time survival studies and the remaining 12 per cent in various tests of mixtures, grades, seed source, brush underplantings, nursery treatments, etc.

Huberman and McKellar established 40 long-time experimental seed beds at the Stuart Nursery. The studies to be carried on are:

1. Fertilizer and soil crop rotation treatments.
2. Relative concentration requirements of Potash, Phosphorus and Nitrogen.
3. Tree per cent studies testing pretreatment, time of sowing, mulch and watering.

4. Cultural studies including cultivation, shading, root pruning, density, etc.
5. Chemical weeding studies.
6. Seedling development (life history) studies.

Biology

Watkins has completed a preliminary report on the wild life on the Harrison Experimental Forest. A total of 38 different species of birds and 17 different species of mammals were observed. The Southern Meadow lark, the Bachman's fox squirrel and the eastern gray squirrel were found to be most destructive predators. Study skins were made of one bird (the pileated woodpecker) and of all seventeen mammals found on the area.

Fire Studies

At Bogalusa, it was found that a fire in an eight year old loblolly pine plantation which occurred in March 1932 caused a mortality of 57.2 per cent and an average reduction in height growth in the surviving trees of two feet during the first, 0.7 of a foot during the second, and 0.9 of a foot during the third season after the fire. The same fire caused a mortality of only 0.7 of one per cent in an eight-year old slash pine plantation and a reduction in height in the surviving trees of 1.3 feet during the first season, 0.6 of a foot during the second and 0.3 of a foot during the third season after the fire. A winter fire late in November killed 86 per cent of the trees in a 13-year old direct-seeded loblolly plantation and only 4.5 per cent in a 9-year old slash pine plantation. The retardation in height in the surviving trees in the slash pine plantations which burned in November amounted to only 0.5 of a foot during the first season after the fire, as against a 1.3 feet retardation caused by the spring fire.

Financial Aspects

Reynolds spent the entire month in the New Orleans Office working up timing and cost data for the selective logging and mill scale study, which he is conducting at Crossett, Arkansas.

R. E. Worthington and Yensco have begun a second study of costs of producting pulpwood from worked out turpentined timber. The present study is being made in the vicinity of Mobile, Alabama.

T. C. Evans and N. P. Worthington left for Lake City the last of the month to start a second study of utilization of worked out turpentined timber for stave bolts and for lumber. This study is to be made in cooperation with Supervisor Albert and his staff on a timber sale on the Osceola National Forest in Florida.

Bond and Wahlenberg have compiled case histories of several forest properties, in order to supply, in cooperation with the Regional Forester, information showing the possibilities of sustained yield forest management, and the social consequences of management where no thought was given to the perpetuation of forest industries.

Land Use

Craig spent five days in the field at Richton, Miss., with W. N. Sparhawk of the Forest Service Washington office of the Bureau of Subsistence Homesteads inspecting the 7700 acres acquired for the Richton Subsistence Homesteads. The area has almost no pine above 8" d.b.h., (possibly enough for 3/10 of a naval stores crop). In some places, there is an adequate stocking of saplings from 1" - 8" d.b.h., but not over 20 per cent of the area is so stocked. Eighty per cent of the purchase area, with the exception of the land to be devoted to crops, is adequately stocked with seedlings less than 1" d.b.h., most of which are out of the grass and just starting height growth. About 2400 acres will have to be planted. Slash pine will be planted, probably on an 8' x 8' spacing (680 trees per acre).

The longleaf is confined to the ridges and slopes, covering probably 75 per cent of the area. The valleys and lower slopes are in slash and loblolly, with numerous hardwood bays.

Diameter growth on longleaf averaged about 2 1/2" d.b.h. per decade, slash about 3" - 3 1/2".

It is estimated that at least 20 years must elapse before regular, annual incomes from the forest area can be counted on. There will, however, be sufficient irregular incomes during the period, from thinnings and from labor paid by the government, to defray the actual carrying charges of the forest area without payment of taxes and without amortization of investment on the part of the homesteaders.

Following his return from Richton, Craig spent the balance of the month in conference with Sparhawk, McCullough, Bond, Eldredge, and Wakeley in drawing up plans for management of the forest area. Present plans call for 25 farms of 40 acres each 30 acres crop, 10 acres tung trees. The remaining 6700 acres will be developed as a community forest. An alternative plan calls for 40 acres of plantation per farm, and a 5700-acre community forest.

Tentative management plans were drawn, one for the 40-acre farm unit of woodland, and one for the 6700-acre community forest.

It is possible that the government will buy an additional area of 5000 acres southwest of Richton and develop it on a similar basis. Such acquisition was recommended by the Station conference,

in order to provide an area sufficient to cut down supervisory and overhead charges to a rate where the homesteaders on the cooperative can carry them.

Forest Survey

On March 4, Mr. Silcox was present at a conference in which Eldredge outlined for him the past and proposed future work of the Survey. The Forester expressed his satisfaction with the results. On March 14 Eldredge and Lehrbas joined Mr. Silcox and party for an inspection trip through southern Mississippi, Alabama and north Florida.

The Station Library received this month a compendium text entitled Practical Applications of the Punched Card Method to which P. R. Wheeler, Asst. Forest Economist, contributed a chapter. Wheeler gives an excellent summary of the uses to which electric tabulating machines can be put in assimilating Survey data.

Preparatory to meeting the needs of further expansion in Survey publications, the Forest Survey enlisted the services of E. C. Garcia, whose duties will include the editing of future releases and the preparation of monthly reports and other items of general interest. He entered the service on March 6.

Progress reported by the field crews during the month included the last remnants of field work in the 29 million acres of the bottomland hardwood region of the Mississippi River delta, and the completion of field work in Mississippi Unit #3. Mississippi is thus the first state in the South to be wholly surveyed. Other units completed by the field crews during the month are: Texas #1; and Louisiana Units #3, & 4; making a total of approximately 117 million acres surveyed up to April 1.

Continuing work on the crop meter survey, Junior Forester Smith spent part of the month making plans and preparations for a check survey of Florida Unit #1. He left on March 14, estimating that it would require 3 weeks to cover 1800 miles of Federal and State roads in the Unit. The object of the crop meter survey, a method of roadside observation and recording while travelling slowly in a car is to record forest acreage and turpentine crop history acreage, and to compare acreages arrived at by this system with those obtained through line plot studies.

During the month tables were completed for the preliminary releases of pulpwood and naval stores supplies in Georgia Unit #2. Both releases are scheduled to appear in April.

Forest Entomology

Nearly the whole month of March was spent in the Canal Zone - part of the time with Dr. F. C. Craighead, inspecting tests of wood preservatives installed in 1924 on Barro Colorado Island.

On the return trip, stops were made in Costa Rica, Spanish Honduras, and Cuba, where some miscellaneous information of forest insects was obtained.

During the latter part of the month, the Monsanto Chemical Works installed cooperative tests at Crown Point, La., of both chemical sprays to prevent attack to green lumber by Ambrosia Beetles, and soil poison tests to prevent termite attack.

RESEARCH IN REGION 2

No reports were submitted for January and February owing to Roeser's absence on a two-months' detail in the Washington Office. During his absence, E. R. Lepley of the Uncompahgre Forest staff was detailed to the Colorado Springs office. Lepley's time was given almost entirely to transcribing and compiling sample plot data relating to management study projects. No opportunity has been had to summarize results. This report, therefore, consists primarily of a record of work accomplished during the period in question.

Type Study (T-1):

Two FERA students were employed to compute the 1934 soil moisture data obtained at the Fremont Station. They also made a final check of the climatological data for Station M-1 (Monument Nursery) which were compiled early in 1934. The climatological record is now in final form (except for summarizing) for all of the stations in this project through March, 1934.

Management Study Projects:

The results obtained in a 20-year old two-plot thinning study in a 135-year old ponderosa pine pole stand in the Black Hills indicates that light thinning in stands of this character can hardly be expected to result in any appreciable stimulation of diameter growth or to have any practical value as a silvicultural measure in bringing the stand to more rapid maturity. The effect of thinning upon diameter accretion and volume increment are briefly summarized as follows (the data are on a one-acre basis):

Plot No.	Character of treatment	Left after thinning		Average diameter increase in 20 yrs.	Increment per acre annum		
		Basal Area (sq. ft.)	Merch. volume (Bd. ft)		Cubic Feet Gross	Board Feet Net	Board Feet Gross
1	Practically unthinned	141	14079	.934	60.0	230	310
2	Light cut removing approximately 1/3 of volume	100	10436	.894	76.0	190	297

Growth Studies on Cut-over Areas (Mc-6)

The final report for that part of the project dealing with the Engelmann spruce type has been submitted by Supervisor W. J. Pearce. This report covers the results of strip survey studies conducted by administrative officers under the direction of the Experiment Station on all forests within the region in which the spruce type occurs. Actual and predicted yields up to 50 years following cutting have been computed for cut-over stands of varying residual densities, thus providing practical information for determining when second cuts may be made under various degrees of cutting and silvicultural treatment throughout the Region.

MANUSCRIPTS

PACIFIC NORTHWEST

Andrews, H. J.	Progress of the Forest Survey. (For Forest Log)
Bolles, W. H.	Extensive type mapping in the Douglas fir region
Bolles, W. H.	Swedish gang saws. (For New York State Ranger School Alumni News)
Briegleb, P. A.	Timber resources. (To be published as a part of the "Loggers' Handbook" by The Timberman)
Cowlin, R. W.	No trees for old. (Submitted to Annual Cruise)
Cowlin, R. W.	Timber ownership in the Douglas fir region. (Submitted to West Coast Lumberman)
Frost, L. W.	Final report on the timber reconnaissance and mapping of the Pringle Falls Experimental Forest.
Isaac, Leo A.	"Seedling Establishment in Relation to Certain Environmental Factors on Logged Areas in the Douglas Fir Region." (For J.A.R.)
Johnson, H. M.	Properties and utilization of northern black cottonwood. (The Timberman)
Kolbe, E. L.	Report on examination of the proposed Blue Mountain Experimental Forest and Range.
Kolbe, E. L.	The proposed Pringle Falls Natural Area within the boundaries of the Pringle Falls Experimental Forest.
Lodewick, J. E.	Volume of cascara bark shipments from the Pacific Northwest, 1920-1934. (Mimeo.)

	Log, round timber and burl exports from Washington in 1927, by districts and by country of destination. (Mimeo.)
	Log, round timber and burl exports from Washington in 1934, by districts and by country of destination. (Mimeo.)
	Log, round timber and burl exports from Oregon in 1934, by districts and by country of destination. (Mimeo)
Station Staff	Bibliography of selective logging.
Wilson, S. A.	The new public domain and wasteful practices. (For Annual Cruise)

LAKE STATES

Shirley, Hardy L.	"Lethal Temperatures for Conifers and the Cooling Effect of Transpiration," (For J.A.R.)

APPALACHIAN

Abell, Charles A.	Forest Research, Forest Education, Cooperation. (Prepared addresses for forestry class program of the Monongahela National Forest at Davis-Elkins College).

IN PRINT

Appalachian Station	Control of Exposed Soil on Road Banks. Tech. Note No. 12
Eldredge, I. F.	The Forest Survey in the South (Jour. of For. April, 1935)
McArdle, Richard E.	A Visibility Meter for Forest Fire Lookouts. (Jour. of For. April 1935)

McArdle & Isaac — The ecological aspects of natural regeneration of Douglas fir in the Pacific Northwest. (Proceedings of Fifth Pacific Science Congress, 1933)

Morey, H. F. and Paul W. Stickel — Numbering Trees on Permanent Sample Plots with Rubber Stamps and Paint. (Jour. of For. April, 1935).

Morris, Wm. G. — Lightning storms and forest fires on the national forests of Oregon and Washington. (Monthly Weather Review, October 1935)

Munger, T. T. — Practical application of silviculture to overmature stands now existing on the Pacific. (Proceedings of Fifth Pacific. Science Congress, 1933)

Reineke, L. H. — Discussion of Demeritt and McIntyre's Method of Constructing Tree Volume Tables (Jour. of For. April, 1935)

TRANSLATIONS

Il Bosco Contro Il Torrente (The Forest Versus the Mountain Torrent) By: Prof. G. Di Tella (Published by Touring Club Italiano, Milan, 1912) Translated from the Italian by A. H. Krappe, January, 1935. (No. 109)

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